CLAIMS

1. A defective recombinant adenovirus comprising;
-the ITR sequences,
-a sequence permitting the encapsulation,
-a heterologous DNA sequence,
and in which the E1 gene and at least one of the E2, E4 and L1-L5 genes is non-functional.

2. An adenovirus according to claim 1, characterized in that it is of human, animal or mixed origin.

3. An adenovirus according to claim 2, characterized in that the adenoviruses of human origin are chosen from those classified in group C, preferably from the type 2 or 5 adenoviruses (Ad2 or Ad5).

4. An adenovirus according to claim 2, characterized in that the adenoviruses of animal origin are chosen from adenoviruses of canine, bovine, murine, ovine, porcine, avian or simian origin.

5. An adenovirus according to one of the preceding claims, characterized in that at least the E1 and E4 genes are non-functional.

6. An adenovirus according to one of the preceding claims, characterized in that it is devoid of late genes.

7. An adenovirus according to claim 1, characterized in that it comprises;
-the ITR sequences
-a sequence permitting the encapsulation,
-a heterologous DNA sequence, and
-a region carrying the gene or part of the gene E2.

8. An adenovirus according to claim 1, characterized in that it comprises:
-the ITR sequences,
-a sequence permitting the encapsulation,
-a heterologous DNA sequence, and
-a region carrying the gene or part of the gene E4.

9. An adenovirus according to claim 1, characterized in that the E1, E3 and E4 genes are deleted from its genome.

10. An adenovirus according to claim 1, characterized in that the E1, E3, L5 and E4 genes are deleted from its genome.

11. An adenovirus according to one of the preceding claims, characterized in that it comprises, in addition, a functional gene E3 under the control of a heterologous promoter.

12. An adenovirus according to one of the preceding claims, characterized in that the heterologous DNA sequence contains one or more therapeutic genes and/or one or more genes encoding antigenic peptides.

13. An adenovirus according to claim 12, characterized in that the therapeutic gene is chosen from the genes encoding enzymes, blood derivatives, hormones, lymphokines (interleukins, interferons, TNF and the like), growth factors, neurotransmitters or their precursors or synthetic enzymes, trophic factors (EDNF, CNTF, NGF, IGF, GMF, aFGF, bFGF, NT3, NT5 and the like), apolipoproteins (ApoAI, ApoAIV, ApoE and the like), dystrophin or a minidystrophin, tumor suppressor genes or genes encoding factors involved in coagulation (Factors VII, VIII, IX and the like).

14. An adenovirus according to claim 12, characterized in that the therapeutic gene is an antisense gene or sequence whose expression in the target cell makes it possible to control the expression of genes or the transcription of cellular mRNAs.

15. An adenovirus according to claim 12, characterized in that the gene encodes an antigenic peptide capable of generating an immune response in man against microorganisms or viruses.

16. An adenovirus according to claim 15, characterized in that the gene encodes an antigenic peptide specific for the Epstein Barr virus, the HIV virus, the hepatitis B virus, the pseudo-rabies virus or alternatively specific for tumours.

17. An adenovirus according to one of the preceding claims, characterized in that the heterologous DNA sequence also comprises sequences permitting the expression of the therapeutic gene and/or of the gene encoding the antigenic peptide in the infected cell.

18. An adenovirus according to one of the preceding claims, characterized in that the heterologous DNA sequence comprises, upstream of the therapeutic gene, a signal sequence directing the therapeutic product synthesized in the secretory pathways of the target cell.

19. A cell line infectible by an adenovirus comprising, integrated into its genome, the functions necessary for the complementation of a defective recombinant adenovirus according to one of claims 1 to 18.

20. A cell line according to claim 19, characterized in that it contains, in its genome, at least the E1 and E2 genes from an adenovirus.

21. A cell line according to claim 20, characterized in that it contains, in addition, the E4 gene from an adenovirus.

22. A cell line according to claim 19, characterized in that it contains, in its genome, at least the E1 and E4 genes from an adenovirus.

23. A cell line according to claims 19 to 22, characterized in that it contains, in addition, the gene for the glucocorticold receptor.

24. A cell line according to claims 19 to 23, characterized in that the E2 and E4 genes are placed under the control of an inducible promoter.

25. A cell line according to claim 24, characterized in that the inducible promoter is the LTR promoter of MMTV.

26. A cell line according to claims 19 to 25, characterized in that the E2 gene encodes the 72 K protein.

27. A cell line according to claims 19 to 26, characterized in that it is obtained from the line 293.

28. A pharmaceutical composition comprising at least one defective recombinant adenovirus according to one of claims 1 to 18.

29. A pharmaceutical composition according to claim 28, comprising a recombinant adenovirus according to one of claims 5 to 10.

30. A pharmaceutical composition according to claims 28 or 29, comprising a vehicle pharmaceutically acceptable for an injectable formulation.